Marine-Dredged Materials Management in Massachusetts: Issues, Options and the Future

A student project of the MIT Sea Grant College Program with supervision and assistance from the Massachusetts Coastal Zone Management Office.

Eric Jay Dolin
and
Judith Pederson, Ph.D.

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CZM

This Report is one of a series of reports arising from a successful collaboration between the Massachusetts Institute of Technology (MIT) Sea Grant College Program and the Massachusetts Coastal Zone Management Office (MCZM). Dr. Madeleine Hall-Arber and Dr. Judith Pederson identified three projects at MCZM that they felt (1) would be a valuable educational experience for an MIT student and (2) would advance the operating objectives of MCZM if successfully carried out. Mr. Norman Doeling of MIT Sea Grant College Program worked with Dr. Pederson in identifying appropriate students for each of the projects. Dr. Pederson worked with and supervised the students involved.

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LIST OF ABBREVIATIONS

BCR	Benefit-Cost Ratio
CEQ	President's Council on Environmental Quality
C.M.R.	Code of Massachussetts Regulations
CZMA	Federal Coastal Zone Management Act of 1972
CWA	Federal Clean Water Act
DEIS	Draft Environmental Impact Statement
MDEM	Massachusetts Department of Environmental Management
MDEP	Massachusetts Department of Environmental Protection
MDFWELE	Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENF	Environmental Notification Form
EOEA	Massachusetts Executive Office of Environmental Affairs
FONSI	Finding of No Significant Impact
GEIR	Generic Environmental Impact Report
MBDS	Massachusetts Bay Disposal Site
MCZM	Massachusetts Coastal Zone Management Office
MEPA	Massachusetts Environmental Policy Act
M.G.L.A.	Massachusetts General Laws Annotated
MP	Management Plan
MPRSA	Marine Protection, Research, and Sanctuaries Act
NED	National Economic Development
NIMBY	Not In My Backyard
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Agency
PCB	Poly Chlorinated Bi-Phenyls
USACOE	United States Army Corps of Engineers
U.S.C.A.	United States Code Annotated
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WPA	Massachusetts Wetlands Protection Act

INTRODUCTION

The goal of this document is to create a common base of information that can be used by all interested parties as a starting point for discussing how best to devise a long-term, marine-dredged materials management strategy for Massachusetts. It expands on the information presented in a 1987 white paper on the "Status of Dredged and Excavated Material Disposal Options for Boston Harbor," (Pederson, 1987). To achieve this goal, the document reviews the various options for managing marine-dredged material as well as federal, state, and local laws that determine under what circumstances those options can be used. It also describes the Commonwealth's past and present efforts, and suggests possible future efforts to develop a marine-dredged materials management strategy.

For the purposes of this document, it is important to distinguish between excavated and dredged material. The former is defined as material that is removed from areas above the mean high water line and can include, but is not limited to, contaminated and uncontaminated soil, gravel, sand, building debris, wood, glass, and leather. Dredged material, in contrast, refers to any sediment that is removed from the underwater environment as a result of dredging operations and can include, for example, contaminated and uncontaminated silts, clay, gravel, boulders, and sand. Because the vast majority of the dredged material generated in Massachusetts comes from the marine environment, this document focuses on the management of such materials.

The second section of the document gives a brief introduction to the issues pertaining to marine-dredged materials management in Massachusetts. The third section describes the various management options for contaminated and uncontaminated material. The fourth section is a broad overview of the federal, state, and local laws governing marine-dredged material management. The fifth section discusses the past work of the Interagency Committee on Marine-Dredged Material Disposal, while the sixth and concluding section considers present and future efforts of the recently convened Task Force on Marine-Dredged Materials Management. At the end of the document there are references and a bibliography that the reader can use to gather additional information.

DREDGED MATERIAL MANAGEMENT: THE BASICS

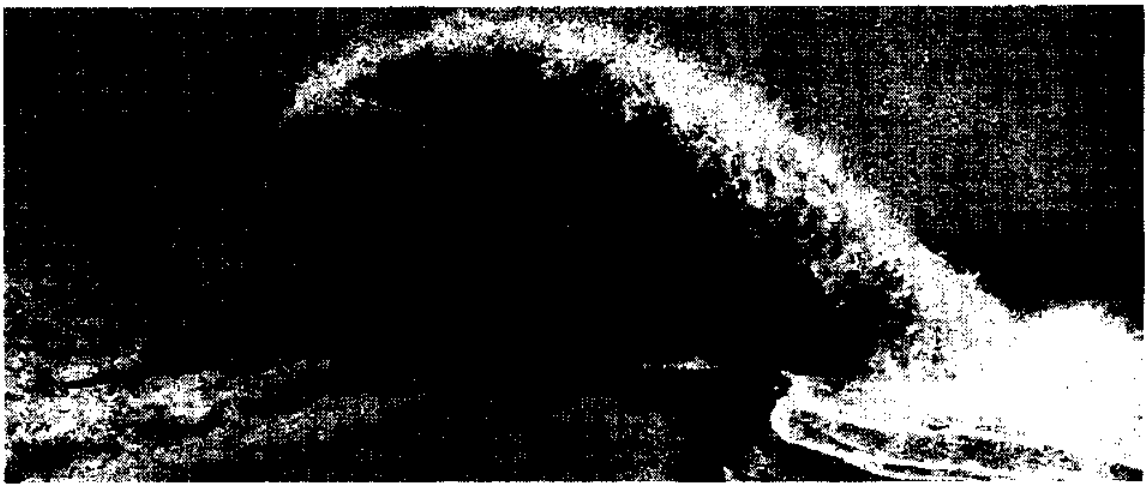
Navigational improvements in ports and harbors and coastal development projects such as marinas and piers all generate dredged materials. Whether these materials are contaminated or relatively clean, they must be effectively managed. Marine-dredged materials management is defined here as the management of the disposal or re-use of such materials, including the regulatory, technical, environmental and economic issues that affect the selection of disposal or re-use options. The available management options fall into three broad categories that are defined by the location in which they take place. Dredged materials can be placed in the open ocean, the nearshore environment, or upland. The specific management options associated with each of these categories, e.g., placing the dredged material in a nearshore containment facility, are discussed in detail in section three. Whatever option is selected, marine-dredged materials management is a complex process that potentially involves many different actors including federal, state, and local agencies, elected representatives, and the public.

In recent years in Massachusetts it has become more difficult to dispose of marine-dredged material or use it as fill. State and federal agencies have often interpreted the relevant laws differently and, as a result, disagreed about what are and what are not acceptable management options. These disagreements are most strident with respect to contaminated sediments which pose the greatest potential threat to the environment. Regulatory decisions concerning relatively clean dredged materials, on the other hand, are much less controversial because the potential negative impacts associated with managing those materials is greatly reduced. The specific disagreements concerning the management of dredged materials are discussed throughout the document and focus on a variety of issues including the methods used to assess the severity of sediment

contamination, the use of "capping" for disposal of contaminated sediments, economic issues surrounding the selection of management options, and the power of different laws to determine where dredged materials can be disposed of or re-used.

Management of marine-dredged materials must also be accepted by the public, where opposition has virtually foreclosed the use of certain options. For example, due to the strength of the not-in-my-backyard syndrome (NIMBY), it is almost impossible to site a new landfill in the state that could accept marine-dredged material. Furthermore, management options are usually circumscribed by financial considerations.

Despite the obstacles to managing dredged materials, the need for such management is clear. Over the next fifty years, approximately 15 million cubic yards of marine-dredged material will be generated in Massachusetts as a result of navigational and coastal development projects (U.S. Army Corps of Engineers, New England Division, personal communication). The proponents of these projects, e.g., federal, state, and private interests, will have to find a means of managing the dredged materials in an environmentally sound and legally acceptable manner.



Beach nourishment project using hydraulically dredged sand

MANAGEMENT OPTIONS FOR MARINE-DREDGED MATERIAL

Management options are circumscribed by many factors including regulatory requirements and restrictions, site availability, and feasibility, e.g., economic and non-economic constraints. Potential management options in the state of Massachusetts fall into three broad categories:

- **Open ocean** — with and without capping;
- **Near-Shore** — subaqueous borrow pits, containment areas and islands, habitat creation, and beach nourishment; and sidecasting;
- **Upland** — landfilling and landfill capping, habitat creation, and commercial re-use.

OPEN OCEAN

Ocean disposal sites are normally designated by the United States Environmental Protection Agency (USEPA) on the authority granted to it by the Marine Protection, Research and Sanctuaries Act (MPRSA), but sites can, under certain circumstances, be selected by the United States Army Corps of Engineers (USACOE). Since the 1940s, much of the marine-dredged material generated in Massachusetts, both contaminated and uncontaminated, has been disposed of at the Massachusetts Bay Disposal Site, (MBDS) which is located roughly 22 nautical miles east of Boston in about 300 feet of water (the MBDS was formerly referred to as the Foul Area Disposal Site). In the early 1970s, USEPA designated the MBDS as an interim disposal site under MPRSA and now is in the process of deciding whether to grant final designation. Being so designated does not mean that marine-dredged material can automatically be sent to the MBDS for disposal, it only means that ocean disposal can be considered as a management alternative on a case-by-case basis during the permit review process. Before ocean disposal is allowed, two criteria

must be met. First, in line with the regulatory requirements of MPRSA, the project proponent must show that all practicable alternatives to ocean disposal have been explored and found unavailable or not feasible according to the regulatory guidelines. Once that criterion is met, the proponent must, also in accord with MPRSA, show that the marine-dredged material in question is physically, chemically, and biologically acceptable for ocean disposal. In the New England region, this acceptability determination is based on an evaluation of marine-dredged material that is prescribed by two complementary sets of testing protocols. One of these protocols is described in the USEPA/USACOE document titled Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual (February 1991), while the other comes from the USEPA (Region 1)/USACOE (New England Division) document titled Guidance for Performing Tests on Dredged Material to be Disposed of in Open Waters (May 15, 1989). Together, these protocols require a three-tiered review process. Tier I is to review historical data and to determine if the material is likely to contain contaminants of concern as defined by MPRSA (contaminants of concern include organohalogen compounds, mercury and mercury compounds, and oil of any kind or form). Tier II is a chemical and physical evaluation of the dredged material, including bulk sediment analysis and elutriate testing, and is often used to determine whether biological testing of the material is required. Tier III is the biological evaluation of the proposed dredged material. During Tier III analyses, two types of biological tests are used — bioaccumulation studies and bioassays on selected test organisms. The former determine whether the contaminants of concern are likely to be concentrated as they are passed up through higher levels of the food web, thereby posing potential health threats to organisms at those higher levels, including man. Bioassays are intended to measure mortality and sub-lethal effects associated with the accumulation of contaminants in organisms. It is important to note that there is not universal agreement on the species that must be used for bioaccumulation and bioas-

Split-hull hopper dredge

say tests. Specifically, there is concern about the degree of sensitivity of the organisms presently used and whether they are representative of the uptake characteristics of benthic species normally found in and around disposal sites.

Even if the dredged material fails the testing protocols, there is still the possibility that it will be allowed to be disposed of in ocean waters. This depends on the ultimate status of capping as a viable containment/management strategy. To see why this is so, consider a dredging project that is currently winding its way through the permitting and review process. The New England Division of the USACOE, with Massport as the local sponsor, is planning to dredge and dispose of roughly 2.1 million cubic yards of material taken from the Mystic River, Chelsea River, and the Reserved Channel (U.S. Army Corps of Engineers, September 1988). In addition, Massport is planning to dredge and dispose of 800,000 cubic yards of material coming from the same three areas as the larger project. For the purposes of the Massachusetts Environmental Protection Act (MEPA) Environmental Impact Report (EIR) process, these two projects are being reviewed as one large project, commonly referred to as the Boston Harbor Navigation Improvement Project. Of the 2.9 million cubic yards of marine-dredged material that will be generated by this project, it is estimated that a significant percentage of it will fail the testing protocols and, therefore, be too contaminated to be disposed of at an open ocean site. The Corps, however, has proposed that this material be disposed of at the MBDS and then be covered or capped by a layer of clean sediments which would also be generated by the project.

According to the literature, capping has been successfully used at a limited number of ocean sites around the nation, e.g., Long Island Sound, the New York Bight, and the Duwamish Waterway near Seattle (Office Of Technology Assessment, 1987; Kester et. al., 1983; and O'Conner and O'Connor, 1983). Many interested parties, however, including the Massachusetts Coastal Zone Management Of-

fice (MCZM), USEPA, the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), members of the scientific community, and environmental groups question the technical viability and environmental soundness of open ocean capping at the MBDS and occasionally at other specific locations. One of the concerns has to do with the depth of capping. All of the examples of capping are in relatively shallow water, usually less than 100 feet. The MBDS is at a depth of roughly 300 feet, and there is some question as to whether capping operations at this depth are practical. For example, placing an effective cap in such deep waters presents a number of technical obstacles, e.g., successfully using taut-wired buoys to ensure precise barge location at the time of dumping so that the capping material is placed directly over the contaminated material, and maintaining the cohesion of the plume of dumped materials as they descend into place. Other concerns about capping include the stability of the cap during storm events, the potential for contaminants in the underlying sediments to diffuse through the cap, and whether sufficient clean material is available, temporally and volumetrically, to create an adequate cap.

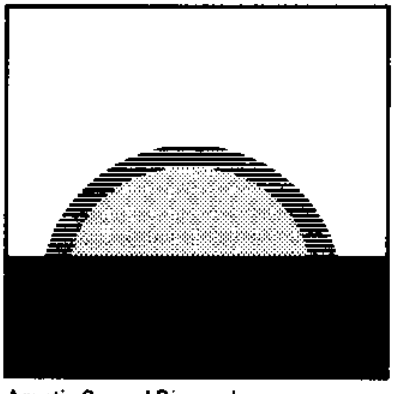
Assuming that capping is deemed feasible at the MBDS, that doesn't mean that this management strategy can be used for other dredging projects that generate contaminated material. Indeed, there is some question as to whether there will be enough clean sediments available in the future to build effective caps. Thus, should the Boston Harbor Navigation Improvement Project receive permission to cap, it may be the last time such permission is granted (pers. comm. B. Hubbard, USACOE).

Another important issue is how the material will be transported from the dredging site to the ocean disposal site. The usual method is to use barges, which can require many trips. For example, in the USACOE's Environmental Assessment (EA) for the Boston Harbor Navigation Improvement Project they state that: "a clamshell bucket dredge will load the excavated material onto barges to be transport-

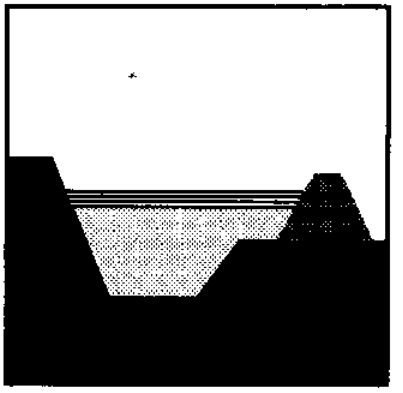
ed to the . . . (MBDS). This disposal would total approximately 2.1 million cubic yards of material and require approximately 1500 barge trips. The project will take approximately 17 months to complete with disposal continuing year round" (U.S. Army Corps of Engineers, September 1988 — EA-8). Given this level of activity, the cost of transporting dredged material is a major consideration in evaluating disposal options. Another factor to consider is the potential navigation and boating problems/hazards that may arise.

NEAR-SHORE

Near-shore marine-dredged material management options are those that take place in coastal or territorial waters, also referred to as 404 waters, or directly impact such waters. According to federal law, these waters include harbors, bays, estuaries and those that extend up to three nautical miles offshore from the mean low tide mark. In Massachusetts, the state's territorial waters extend beyond three nautical miles along some stretches of the shoreline, and these areas are included in future references to coastal or territorial waters and 404 waters. The management options available in near-shore waters include subaqueous borrow pits, containment areas and islands, habitat creation, beach nourishment, sidecasting, as well as capping, which was discussed in the previous section and is only touched on here with respect to subaqueous borrow pits.



Aquatic Capped Disposal



Aquatic Capped Disposal

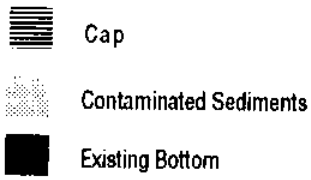
Before any form of near-shore discharge of marine-dredged material is allowed, the project proponent must meet many regulatory requirements. The proponent must show that all practicable alternatives to near-shore disposal have been explored and found unavailable or not feasible. The authority for this requirement can come from either MPRSA or the Clean Water Act (CWA). For disposal activities in near-shore waters, with the exception of estuaries and waters landward of the mean low water mark, it is MPRSA that requires the proponent to determine that other, practicable disposal alternatives

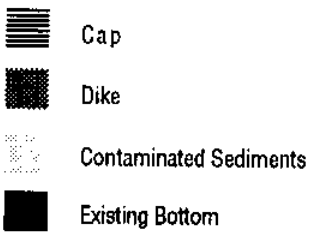
are unavailable. For disposal activities in estuarine waters or waters landward of the low mean water mark and for fill activities in any near-shore waters, it is the CWA that requires other alternatives to be explored and found wanting before discharging dredged material. The proponent must also show that the dredged material will be physically, chemically, and biologically acceptable for near-shore disposal. This acceptability determination is comprised of two parts. One part applies the three-tiered evaluation process described in the last section. The other part involves the issuance of a Water Quality Certificate from the Massachusetts Department of Environmental Protection (MDEP), which ensures that the proposed dredging and disposal operations will not violate applicable state water quality laws. In addition, there are other federal, state, and local laws that must be complied with before dredged material can be discharged in near-shore waters — the specific laws invoked depend upon the nature of the discharge activity.

Subaqueous Borrow Pits

Subaqueous borrow pits are created when sediments, usually sand and gravel, are mined from coastal areas such as harbors and bays. These pits may be shallow (a few feet) or quite deep (tens of feet) and can be anywhere from a few acres to many thousands of acres in size. For example, during the environmental review of the Central Artery (I-93)/Third Harbor Tunnel (I-90) Project in Boston, two subaqueous borrow pits were identified as potential disposal sites. These pits are located off the northern and western sides of Logan Airport. One of these pits is roughly 3/4 of mile long and 1/4 of a mile wide and was estimated to be able to contain one million cubic yards of dredged material.

Disposing of clean material in subaqueous borrow pits requires no capping. The material is simply used to fill up the pit to the point at which the latter disappears — what was the pit is now an expanse of sediment that is level with the surrounding topography. Dredged





material found to be unsuitable for near-shore disposal may still be placed in borrow pits if the material can be successfully capped, thereby keeping the contaminants from entering the water column or the food web (capped subaqueous borrow pits are also referred to as contained aquatic disposal sites). The viability of capping borrow pits located near-shore and in shallow water is less controversial than the capping of dredged material at relatively deep open ocean sites, such as the MBDS. This is largely because there are examples of successful capping operations at relatively shallow near-shore sites (see discussion in the previous section on the open ocean). Nevertheless, there are also cases of unsuccessful shallow water capping operations. For example, in New Bedford Harbor the Corps filled one subaqueous borrow pit with marine-dredged material contaminated with polychlorinated biphenyls (PCB) and then capped the pit with clean sediments (U.S. Army Corps of Engineers, New England Division, June 1989). Since the completion of the capping in early 1989, the integrity of the cap has diminished to the point where contaminated materials have, in numerous areas, migrated to the surface where they are in direct contact with the water column. In light of examples such as this there are still disagreements among the various interested parties as to the efficacy of capping subaqueous borrow pits.

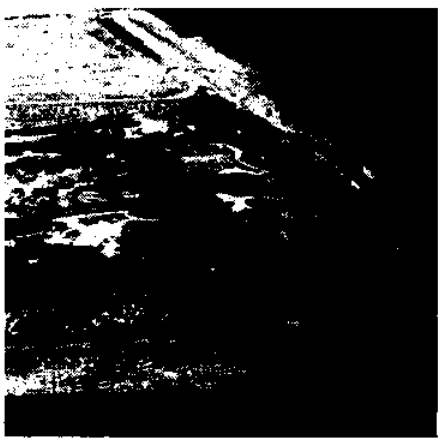
Containment Areas and Islands

As the name implies, the basic purpose of containment areas and islands is to contain dredged material in such a way that negative impacts on the environment are minimized. (Containment areas and islands are also referred to as confined disposal facilities.) This is done by filling in diked areas with dredged material to create a containment area off the end of an existing land mass or an artificial, containment island. In either case, once the dredged material is placed within the diked area it is dewatered, usually over a period of years, to create dry land which can then be capped, if necessary, and used for a variety of beneficial purposes including recreation, habitat

creation, or as the foundation for development projects.

Containment areas and islands use a variety of designs to isolate dredged material from the surrounding environment. In some cases, an impermeable layer of clay or plastic is placed in the containment facility to prevent leaching. Other facilities are built upon relatively impermeable native materials, e.g., clay or densely packed sediment, that serve to restrict leaching. And still other facilities rely on the finer sediments of the dredged material itself to collect at the bottom and sides of the facility, thereby serving as a natural and, hopefully, impermeable barrier. Leachate control is not the only concern with respect to containment facilities. There is also a need to control the effluent that can escape over the top of the facility's sides and into the surrounding environment. Most containment facilities use either a weir or a treatment system to regulate the rate and composition of the effluent.

There are containment areas and islands throughout the country and they have been used for both contaminated and uncontaminated marine-dredged material disposal. For example, the Craney Island containment facility off the coast of Virginia has been in operation for over 40 years. And in Tennessee, the Presidents Island-Memphis Harbor Project used sandy dredged material to fill in a diked, 960 acre area that, in turn, became the foundation for over 70 businesses. Here in Massachusetts, the New England Division of the Corps constructed a containment area in New Bedford Harbor into which PCB-contaminated marine sediments have been placed.



New Bedford containment area

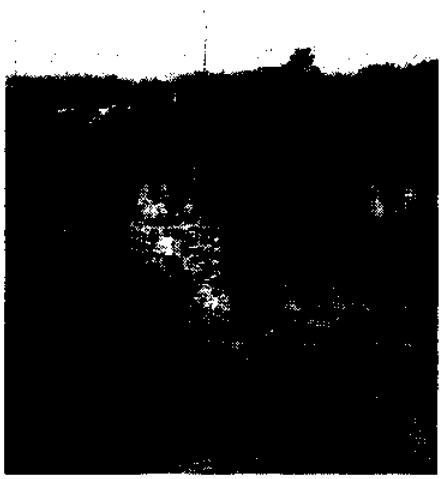
Containment facilities can be very expensive. A 1988 USACOE report estimated that the costs of constructing a 500 acre containment island ranged from a low $9.9 per cubic yard of storage capacity up to $34.7 per cubic yard (1987 dollars), depending on the type of facility (e.g., sand dike or sheet pile cofferdam), the volume of the facility (from 6.6 to 28.2 million cubic yards), and the level of treatment for the facility's effluent (Walski and Schaeffer, April 1988).

The costs of using containment facilities depends on both the

operating and maintenance costs of the facility itself and the costs of transporting the dredged material to the facility. The operating and maintenance costs are highly variable and can easily run into the millions of dollars per year for large-scale containment areas or islands. The costs of transportation depend primarily on the location of the facilities vis-a-vis dredging operations. The closer the facility is to the dredging site, the lower the investment in moving the material; conversely, the further the barge has to travel, the higher the cost. If the dredging site and the facility are very near to one another, an additional cost saving can be gleaned by changing from the use of a mechanical dredge, e.g., a clamshell dredge or dragline, to a hydraulic dredge. Mechanical dredging and the subsequent barging of the dredged material to a facility is more expensive than hydraulic dredging in which the material can simply be "sucked" off the bottom and pumped directly into the facility. Hydraulic dredging can, however, create other problems, such as the need for a longer dewatering period because hydraulically dredged material has a much higher ratio of water to sediment than does mechanically dredged material.

One of the concerns about containment areas and islands has to do with the oxidation state of sediments and the mobility of contaminants. Marine-dredged material, which is often relatively anoxic, may become aerated or oxic once it is placed in a containment facility. Unfortunately, in the oxic state many of the contaminants, e.g., trace metals, which were formerly bound to the sediment become mobile. Thus, special precautions, e.g., treatment, may have to be taken for contaminated sediments being placed in a containment facility.

Another concern about containment areas and islands is the habitat they replace. This is especially important in light of the national policy of "no-net loss" of wetlands, for virtually all near-shore containment facilities are built in wetland areas.



Wetland creation

Habitat Creation

As indicated earlier, habitats can be a by-product of containment is-

land or area creation. Habitat can also be created directly through the application of marine-dredged material to near-shore sites. For example, there are numerous instances in which marine-dredged material has been used to create wetlands and various underwater habitats, including reefs, oyster beds, and seagrass meadows.

Salt Pond #3 Salt Marsh in South San Francisco Bay is one example of near-shore habitat creation. In the mid-1970s, the USACOE began filling part of a 100 acre saltwater evaporation pond with clay and associated materials that were dredged from a nearby location. With the fill in place, the Corps began planting Pacific Cordgrass and pickleweeds which took hold and subsequently colonized adjacent unvegetated areas. Now the marsh is used by a variety of wildlife, especially shorebirds which feed in the shallows.

There are many issues that need to be considered in creating near-shore habitats. For example, the new habitat will invariably replace the habitat that was already there. Thus, it is necessary to balance the benefits gained from the new habitat against the lost benefits associated with the old habitat. Also, for the new habitat to be a permanent feature, it is essential that its stability be evaluated. This is done, in part, by assessing the energy conditions present at the site, e.g., wave action and tides, to determine if the created habitat can withstand them. If the new habitat is likely to be washed away by the next moderate storm, it probably shouldn't be built. In general, low energy areas are most suitable for habitat creation.

Beach Nourishment

Just as marine-dredged material can be put to some beneficial use in habitat creation, so too can it be beneficially used for beach nourishment. In this process, uncontaminated marine-dredged material is used to replace sand that has been washed offshore or downshore by winds and waves, thereby countering the effects of coastal erosion. The key to determining the appropriateness of marine-dredged material for beach nourishment is the nature of the material itself and

its compatibility with the substrate found on the beach. Specifically, the biological, physical, and engineering characteristics of the dredged material should match, as closely as possible, the characteristics of the sand found on the beach. For example, only coarse-grained dredged material could be used as nourishment for a coarse-grained sand beach. Without such compatibility, beach nourishment activities will inevitably fail.

Compatible dredged material can be transported to the beach nourishment area by truck, split-hull hopper dredge, or by a hydraulic pipeline that leads directly from the dredging site to the nourishment area. In some cases, the dredged material is placed directly on the beach, while in other instances, it is placed slightly offshore where wave and current action will eventually carry it onto the beach. In certain circumstances, the dredged material will first be dewatered in a holding area before being placed on the beach.

The primary environmental impacts of beach nourishment operations are the direct destruction of organisms due to burial. In many cases, however, that which is initially destroyed by the placement of large quantities of dredged material on the beach is restored over time through recolonization. Experience has also shown that newly renourished beaches appear to be favored nesting places for some shore birds such as least and common terns.

MCZM has, since its inception, had policies requiring that state-funded activities in the coastal zone result in the widest possible public benefits. With respect to marine dredging operations, this has been interpreted to mean that dredged material consisting of clean sand should be used, whenever possible, for beach nourishment.

Beach nourishment

Sidecasting

Sidecasting is a hydraulic dredging technique that involves the discharge of dredged materials to one side of the channel without interruption of dredging operations. A specially equipped, self-propelled dredge is used for sidecasting, with a discharge pipe that can be

Sidecasting

swung 90 degrees to either side of the dredge. As sediments are removed from the channel bottom, they are immediately discharged and allowed to settle along one side of the newly dredged channel. The method is used where sediments, such as clean sand, are amenable to hydraulic dredging and have rapid settling rates, reducing the possibility of creating an extensive turbidity plume. Because sidecasting involves direct redeposition of dredged materials into the aquatic environment, it is not suitable for use in areas that contain contaminated sediments.

Sidecasting, which is a quick and relatively cheap management option, is more frequently used in the southern U.S. where the frequency of channel maintenance and cost-effectiveness are especially important factors. Its advantages lie in eliminating long runs of discharge pipe, the fact that it is an entirely self-contained and mobile operation, and its low manpower requirements. A disadvantage is that the benthic habitats along the dredged channels sides may be buried by the discharged materials, but recolonization is relatively rapid due to the shallow depth of materials which are spread out over a large area.

UPLAND

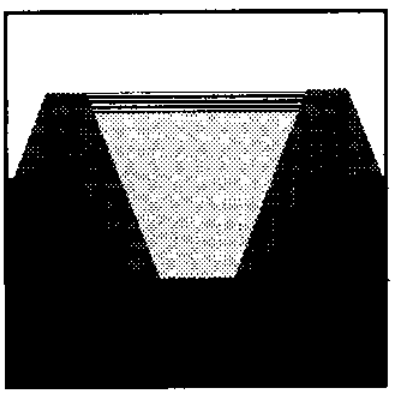
The management options for marine-dredged material are not limited to those areas either in or affecting the marine environment. Upland management options include landfilling or landfill capping, habitat creation, and commercial re-use. Each of these options is potentially subject to a variety of federal, state, and local laws and regulations, and is further circumscribed by issues of feasibility, such as the availability of landfill space within the state and the difficulties and costs of transporting dredged material from the dredging site to the upland management area.

Landfilling and Landfill Capping

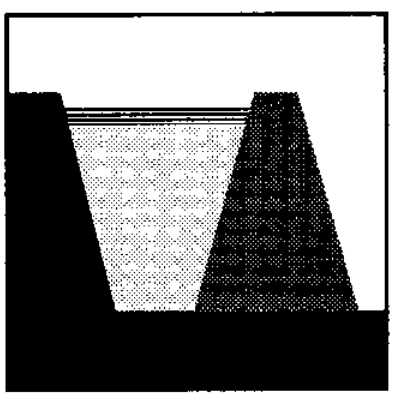
Relatively clean dredged material can be placed in a sanitary (non-

hazardous waste) landfill or used as landfill cover for either a sanitary or a hazardous waste landfill. For sanitary landfills, clean, dredged material is used for two purposes. First, as a daily cover for the garbage that has been dumped and spread over the landfill during the day. The primary purpose of this daily cover, which is usually roughly 0.3 meters thick, is to prevent pathogens from being carried off-site by birds and rodents. The cover also serves as an odor barrier and a fire retardant. The other use of clean, dredged material at sanitary landfills is as a final cover or cap once the landfill reaches capacity and must be closed. Final cover is anywhere from 0.6 to 1.5 meters thick and must be able to support the vegetation that will be planted to improve the site's aesthetics and reduce erosion. The final cover also controls infiltration, percolation, and gas transfer between the landfill and the surrounding environment. The techniques for covering hazardous waste landfills with clean, dredged material are the same as those used in sanitary landfills, except the cover may have to be thicker and less permeable to percolation, infiltration, and gas transfer.

The placement of marine-dredged material in or on landfills can be a very involved and expensive process. It is likely that the dredged material would have to be dewatered, so as to reduce its volume and make it easier to handle, before being transported to the site. Dewatering is usually accomplished by placing the dredged material in a containment area as a slurry where excess water runs off through weirs and is also removed through evaporation. It is important to note that the runoff from such containment areas may be contaminated and therefore need to be treated before being released to the surrounding environment. Another common dewatering practice, especially when fine-grained, clayey materials are concerned, is to construct underdrains within the containment area at the time it is built. The underdrains usually lead to a single drainage point where the effluent can be treated if necessary. Dewatering can be sped up by digging drainage trenches in the containment area and by using floc-



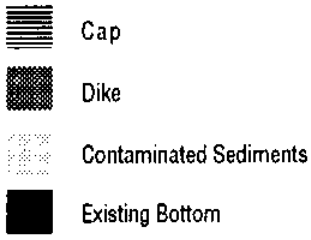
Upland Disposal



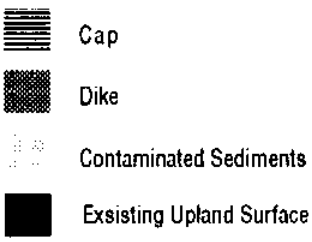
Nearshore Confined Disposal

culants when fine-grained materials are involved. Before the former method can be used, however, the surface of the containment area must be stable enough to support the heavy equipment necessary to dig the trenches. Therefore, it is usually some time after the containment area is filled with the dredged material slurry before drainage trenches can be constructed. It may take up to two years for weirs, evaporation, and/or underdrains to dry out the slurry to the point where it can support the equipment's weight.

Even after dewatering, the dredged material may still be quite wet and may take up a lot of volume, making transportation difficult and expensive. Adding to this expense, at least in the case of landfilling, is the fee that the project proponent must pay before the landfill operator will accept the dredged material at the site. In the case of landfill capping, on the other hand, the landfill operator usually pays to have the dredged material brought to the site. Finally, before any dredged material makes its way to a landfill the MDEP must determine that such disposal or use complies with the appropriate state hazardous and/or solid waste regulations, such as the ones that specify allowable salinity and heavy metal concentrations for materials disposed of at landfills.



There are other potential obstacles to upland disposal that go beyond regulatory compliance, cost, transportation, and the logistics of dewatering. First, there is the question of landfill availability. Landfill space in Massachusetts is somewhat limited, and siting new landfills is extremely difficult. Thus, finding a site to place the dredged material may be problematic. Second, even if space was found, it may not be accessible to the project proponent. The latter would have to get the permission of the landfill owner/operators before disposing of the material in this manner (all landfills in the state are owned/operated by municipalities or private concerns). Third, even if there were accepting owner/operators and a significant amount of available space, proponents of the upland disposal option for dredged material would have to compete with proponents of oth-



er projects who want to dispose of material at landfills or apply that material as landfill cover or capping. It may turn out that contaminated dredged material is last in line when it comes to the highly political allocation of upland disposal space. Finally, there is always the potential that public opposition will halt efforts to use landfills for marine-dredged material disposal, especially if the material is contaminated.

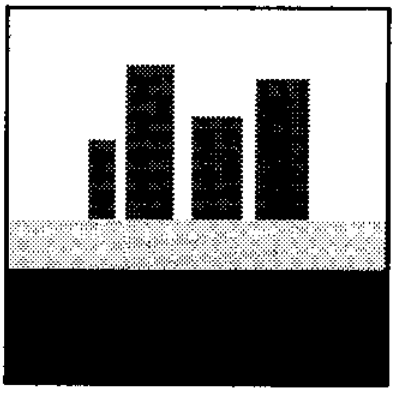
Habitat Creation

Marine-dredged material can be used to create a variety of upland habitats, including forested areas, freshwater wetlands, and meadows. Habitat creation in upland areas shares many characteristics with habitat creation in the near-shore environment (see previous discussion). For example, the creation of new habitat has to be weighed against the destruction of displaced habitat and the energy conditions at the site, e.g., winds and currents, must be factored into the habitat's design.

Commercial Re-use

Yet another beneficial use of marine-dredged material is commercial re-use. Dredged material can be used as the foundation for many projects, including shopping malls, residential buildings, roads, and airports. Indeed, there are even specific technologies that solidify and, when necessary, decontaminate dredged materials for use as building components. These technologies have been used in small scale pilot projects, but could potentially be used in larger projects.

Just as is the case with the use of dredged material for habitat creation, it is important to make sure that the material composition is compatible with the planned use. For example, silts, which comprise most of the dredged materials from urban harbors, do not provide good foundations for buildings. Another consideration, especially important when the dredged material is not clean, is the potential for contaminant leaching into the surrounding environment.



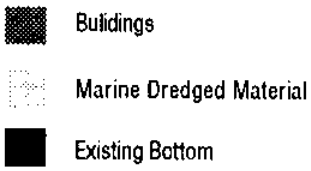
Commercial re-use

FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS

There are many federal, state, and local laws and regulations that pertain to the management of marine-dredged material. At the federal level the most important laws are the Rivers and Harbors Act of 1899 (33 U.S.C.A. 401 et seq), the Clean Water Act (CWA 33 U.S.C.A. 1251 et seq), the Marine Protection, Research, and Sanctuaries Act (MPRSA — also called the Ocean Dumping Act — 16 U.S.C.A. 1431 et seq), and the National Environmental Policy Act of 1969 (NEPA — 42 U.S.C.A. 4321 et seq).

Section 10 of the Rivers and Harbors Act of 1899 prohibits the alteration or obstruction of any navigable waters in the U.S. unless such activities are authorized by the USACOE through the issuance of a permit. The navigable waters of the U.S. include those that are subject to tidal action and/or those that are, have been in the past, or may be in the future, suitable for the purpose of interstate or foreign commerce. The USACOE is also responsible for issuing permits for virtually all dredged material discharge activities in U.S. coastal waters under the authority granted to it by section 404 of the CWA and section 103 of MPRSA. U.S. coastal waters include estuaries and ocean waters extending up to 200 miles offshore (the USACOE also has responsibility for permitting dredged material discharge activities in the inland waters of the U.S., however, this aspect of the Corp's jurisdiction is not covered here).

The specific jurisdiction of the CWA and the MPRSA depends on the nature and location of the management activity. According to the most recent federal guidance on the subject, any disposal of dredged materials in ocean waters, which extend up to 200 miles offshore from mean low water, falls under the jurisdiction of MPRSA. Thus, a project proponent wanting to dispose of dredged material in ocean waters would have to obtain a Section 103 MPRSA permit from the USACOE before proceeding. Any discharge of dredged



material into the territorial waters for the primary purpose of fill, e.g., beach nourishment or island creation, however, comes under the CWA's jurisdiction. Thus, project proponents seeking to conduct fill operations in the territorial waters must obtain a Section 404 CWA permit from the USACOE. This distinction between CWA and MPRSA jurisdiction does not hold in all situations. In cases where the Corps determines that the materials proposed for discharge as fill into the territorial waters would not be adequately evaluated under the section 404 guidelines of the CWA, it may evaluate that material under the section 103 guidelines. Finally, dredged material discharge in estuarine waters, whether it be for the purposes of disposal or fill, falls under the jurisdiction of the CWA and requires a 404 permit from the USACOE.

The USACOE is not the only federal agency involved in the management of marine-dredged material. Using the siting criteria contained in section 102 of MPRSA, the USEPA is responsible for designating dredged material disposal sites in ocean waters. If, however, there are no available USEPA designated sites or those that are available cannot feasibly be used, the USACOE, applying the section 102 siting criteria, has the authority to select an ocean site for the disposal of dredged material. In addition to the authority given to it in Section 102, the USEPA is responsible for reviewing all of the USACOE's dredging disposal permits. Should the USEPA determine that such permits violate any federal laws or have an unacceptable impact on the environment, it can veto the issuance of the permits.

As for NEPA, it requires that all federal agencies proposing a project that may "significantly" affect the quality of the "human environment" prepare an Environmental Impact Statement (EIS). Guidelines for what must be included in the EIS have been developed by the President's Council on Environmental Quality (CEQ), and are used by federal agencies for evaluation of the environmental, social, economic, historic, and archeological impacts of a proposed project and its alternatives (which must include a "no-project" alternative).

The Primary Requirements of

Federal Laws Affecting Marine-Dredged Materials Management

Rivers and Harbors Act of 1899

- Prohibits the alteration or obstruction of navigable waters unless such activities receive permits from the USACOE

Clean Water Act

- Requires fill activities in territorial waters to receive permits from the USACOE
- Requires projects discharging any dredged materials into estuarine waters receive permits from the USACOE, except in certain circumstances

Marine Protection Research, and Sanctuaries Act

- Requires any disposal activities in ocean waters to receive permits from the USACOE
- Sets the criteria that the USEPA and the USACOE use to designate dredged material disposal sites in ocean waters

National Environmental Policy Act of 1969

- Requires all federal agencies proposing a project that may "significantly" affect the quality of the "human environment" to prepare an environmental impact statement

The USACOE is thus required to prepare an EIS for any project that will have a significant impact. The purpose of the EIS is to ensure that all relevant impacts of the proposed project and its alternatives will be considered early enough so that the minimization and mitigation of potential environmental impacts can be effectively addressed at the design stage, prior to the beginning of construction.

In certain circumstances the National Oceanic and Atmospheric Administration (NOAA) may get involved in marine-dredged material management. Under Title III of MPRSA, NOAA is responsible for designating National Marine Sanctuaries. If such Sanctuaries encompass an ocean disposal site or if activities at a site outside the Sanctuary boundary negatively impact the resources or quality of the Sanctuary, then NOAA can exercise its regulatory authority and halt or restrict the use of the site. There is currently the potential for just this type of action off the coast of Massachusetts. NOAA is now in the process of deciding whether to designate Stellwagen Bank, located roughly six miles northwest of Provincetown, and an area surrounding it as a National Marine Sanctuary. The MBDS, which has been and continues to be used as a dredged material disposal site, is located very close to Stellwagen Bank. Thus, depending on NOAA's ultimate designation decision and the Sanctuary's boundary, there may be a conflict between the imperatives of Title III of MPRSA and the desire of dredging project proponents who wish to continue using the MBDS as a disposal site. However, if the Draft Environmental Impact Statement/Management Plan (DEIS/MP) that NOAA wrote for the designation of the Stellwagen Bank National Marine Sanctuary is any indication, this conflict will not result in the categorical exclusion of the MBDS from future consideration as a dredged material disposal site. Instead, the use of the site will be subject to NOAA oversight. According to the DEIS/MP, the preferred alternative for dealing with the regulation of dredged material disposal within the boundary of the proposed sanctuary, which includes the MBDS, is to "allow disposal of dredged material to continue within the Sanctuary,

but NOAA would review permit applications involving the use of the MBDS to determine . . . whether such use is consistent with the purposes for which the Sanctuary was designated. To protect sanctuary resources NOAA may deny certification or require additional conditions as necessary. Disposal of dredged material would be prohibited elsewhere in the Sanctuary" (National Oceanic and Atmospheric Administration, January 1991; 136).

Other federal agencies involved in marine-dredged material management include the NMFS, which is a division of NOAA, and the USFWS. Under the authority of a variety of laws, the NMFS is responsible for managing and conserving living marine resources, including endangered species, within the U.S. territorial waters. In this capacity, the NMFS reviews Corps permits and the USEPA designations of ocean dredged material disposal sites to ensure that the potential impacts of such actions on living marine resources are fully considered. Similarly, the USFWS is responsible for reviewing Corps permits and the USEPA designations to ensure that the potential impacts of such actions on fish and wildlife, especially in wetlands areas, are fully considered.

At the state level there is an equally broad range of legal requirements pertaining to dredging management operations. The most important laws include the Public Waterfront Act (91 M.G.L.A.), the federal CWA, the Massachusetts Environmental Policy Act (MEPA — 30 M.G.L.A. 62-62H), and the Federal Coastal Zone Management Act of 1972 (CZMA —16 U.S.C.A. 1451 et seq).

The Public Waterfront Act, also referred to as Chapter 91, gives the MDEP the authority to develop regulations (310 C.M.R. 9.00) and to issue waterways licenses and dredging permits for any dredging or dredged material disposal in Commonwealth tidelands. The definition of such tidelands includes areas under tidal waters seaward of mean high water extending three nautical miles offshore (or the limit of the state's territorial waters) and areas between the mean high water and the historic mean high water shoreline.

The Primary Requirements of

Massachusetts Laws Affecting Marine-Dredged Materials Management

Massachusetts Public Waterfront Act

- Gives the MDEP the authority to issue waterways licenses and dredging permits for any dredging or dredged material disposal in Commonwealth tidelands

Water Quality Certificate

- Requires applicants for federal permits or licences to conduct activities that might result in the discharge of pollutants into state wetlands or waterways (inland and coastal) to obtain a water quality certificate, issued by the MDEP under authority of section 401 of the CWA

Massachusetts Environmental Policy Act

- For significant projects involving state agencies, MEPA requires project proponents to prepare an environmental impact report

Federal Coastal Zone Management Act of 1972

- Gives Massachusetts, through the office of MCZM, the option of reviewing any federal permitting, licensing, or funding actions or federally conducted activities in the coastal zone to determine whether they are consistent with the state's coastal policies

The Primary Requirements of

Massachusetts Laws Affecting Marine-Dredged Materials Management

Massachusetts Solid Waste Management Act

- Requires projects employing upland disposal of non-hazardous dredged material in sanitary landfills receive permits from the Division of Solid Waste Management within the MDEP

Massachusetts Hazardous Waste Management Act

- Requires projects employing upland disposal of hazardous dredged material in hazardous waste landfills receive permits from the Division of Hazardous Waste within the MDEP

Areas of Critical Environmental Concern Program

- Discharge of marine-dredged material may not occur within ACECs except for very specific purposes, e.g., beach nourishment

The MDEP is also responsible for issuing Water Quality Certificates under the authority of section 401 of the federal CWA (314 C.M.R. 9.00). That section requires any applicant for a federal permit or license to conduct any activity that might result in the discharge of pollutants into state wetlands or waterways (both inland and coastal) to obtain a certificate from the state indicating that the proposed discharge will not violate federal or state water quality standards. According to the MDEP's Water Quality Certificate Program, the state's marine wetlands and waterways are those between mean high water and the limits of the Commonwealth's territorial waters. Similarly, the program defines pollutants to include silt, soil, hazardous contaminants, and fill. Thus, virtually any dredging project in the state's marine wetlands or waterways will require a Water Quality Certificate from the MDEP. The disposal of dredged material beyond the territorial waters, however, does not require a Water Quality Certificate, unless such disposal activities would impact the state's wetlands or waterways.

Just as the federal government has an environmental review process for significant projects that involve federal agencies under NEPA, so too does the state have an environmental review process for significant projects that involve state agencies, in the form of MEPA. The ultimate goal of the MEPA review, like the NEPA review, is to get the project proponent to disclose the potential environmental impacts of the project and to employ all feasible mitigation measures to minimize those impacts that result in environmental degradation. The MEPA process has two stages (see 301 C.M.R. 11.00). If the proposed project exceeds certain thresholds, the proponent is required to submit to the Secretary of the Massachusetts Executive Office of Environmental Affairs (EOEA) an Environmental Notification Form (ENF), which contains preliminary data on the potential impacts of the project. After holding a scoping session and accepting public and inter-agency comments, the Secretary of EOEA decides whether the project requires an EIR. If no EIR is required, the project

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The Primary Requirements of

Massachusetts Laws Affecting Marine-Dredged Materials Management

Massachusetts Solid Waste Management Act

- Requires projects employing upland disposal of non-hazardous dredged material in sanitary landfills receive permits from the Division of Solid Waste Management within the MDEP

Massachusetts Hazardous Waste Management Act

- Requires projects employing upland disposal of hazardous dredged material in hazardous waste landfills receive permits from the Division of Hazardous Waste within the MDEP

Areas of Critical Environmental Concern Program

- Discharge of marine-dredged material may not occur within ACECs except for very specific purposes, e.g., beach nourishment

may proceed. If an EIR is required, the Secretary notifies the project proponent of this finding in a Certificate of the ENF which outlines the suggested scope of the EIR, including the alternatives that should be considered, the potential ways in which the feasibility of those alternatives might be assessed, and the potential mitigation measures that might be taken to reduce the environmental impacts of the selected project. The EIR, like the EIS, is not only intended to get the project proponent to disclose the potential environmental impacts of the project alternatives, but it is also intended to get the proponent to employ all feasible measures to minimize the adverse environmental impacts associated with the preferred alternative. The similarities between the EIR and the EIS is evidenced by the fact that, in many cases, the project proponent is able to submit one document that serves as a combined EIS/EIR, satisfying federal and state requirements simultaneously.

Public and agency comments received during the drafting stage or after submission of the draft EIR must be responded to by the proponent, but the nature of that response is left to the latter's discretion. Similarly, it is the proponent who will decide which project to propose in the final EIR. Finally, the EIR will be evaluated by the Secretary of EOEA to ensure that it substantially complies with the requirements set forth in the scoping document issued in the Certificate on the ENF. If it is determined that the EIR doesn't comply, the Secretary will require the project proponent to prepare a supplemental EIR that addresses the outstanding concerns.

In most cases, once the project proponent has received all the required state permits and completed the MEPA review process, and before the proponent is issued any federal permits or licenses, the MCZM completes a federal consistency review of the proposed project (301 C.M.R. 21.00). Under the implementing regulations of the CZMA, each state with an approved coastal zone management program, such as Massachusetts, has the authority to review federal permitting, licensing, or funding actions or federally conducted ac-

tivities in the coastal zone to determine whether they are consistent with the state's coastal policies. In Massachusetts, there are 27 Coastal Zone Management Program policies, 13 of which are regulatory and 14 of which are non-regulatory. Regulatory policy 1, for example, indicates that the MCZM will ensure the protection of ecologically significant resource areas (salt marshes, beaches, etc.) for their contributions to marine productivity and value as natural habitats and storm buffers, while regulatory policy 5 states that the MCZM will ensure that dredging and disposal of dredged material minimizes adverse effects on water quality, physical processes, marine productivity and public health. As for non-regulatory policies, number 19 urges Massachusetts agencies to promote the widest possible public benefit from channel dredging, ensuring that "designated ports" and developed harbors are given highest priority in the allocation of federal and state dredging funds, and to ensure that dredging is consistent with marine environmental policies. If the proposed project is found to be consistent with state policies, the federal agency can proceed with its activity. However, if federal consistency is denied, the project cannot proceed unless the administrator of NOAA overturns the state's denial.

There are still other state laws and programs that could potentially apply to individual marine dredging projects. For example, upland disposal of non-hazardous dredged material in sanitary landfills must be approved by the Division of Solid Waste Management within the MDEP. The MDEP's review authority in this situation comes from the Massachusetts Solid Waste Management Act (111 M.G.L.A. 150A — 310 C.M.R. 16.00 & 19.00). During this review process, the Division of Solid Waste Management requires that the dredged material be chemically and physically analyzed to determine whether it is suitable for disposal at a landfill or for use as either a daily or permanent landfill cover material. For example, if the dredged material has unacceptably high concentrations of lead, cadmium, or PCBs, as determined by the Division's policies, it may not be placed in a sanitary

MCZM Program Policies Related to Marine-Dredged Materials Disposal

- **Policy 1** Protect ecologically significant resource areas (salt marshes, shellfish beds, dunes, beaches, barrier beaches, and salt ponds) for their contributions to marine productivity and value as natural habitats and storm buffers.

- **Policy 5** Ensure that dredging and disposal of dredged material minimize adverse effects on water quality, physical processes, marine productivity and public health.

- **Policy 19** Promote the widest possible public benefit from channel dredging, ensuring that designated ports and developed harbors are given highest priority in the allocation of federal and state dredging funds. Ensure that this dredging is consistent with marine environmental policies.

landfill for any purpose. The presence of such contaminants may cause the Division to classify the dredged material as a special waste, thereby making it subject to special management and handling requirements, e.g., liming to control odors or dewatering. Finally, the Division of Solid Waste Management may determine that the dredged material is so contaminated that it must be managed as a hazardous waste. In that case, it is up to the MDEP's Division of Hazardous Waste to evaluate the proposed disposal of the dredged material at a hazardous waste landfill. The Division's authority for this review comes from the Massachusetts Hazardous Waste Management Act (M.G.L.A. 21c, 310 C.M.R. 30). It is important to note that the Division of Hazardous Waste need not get involved only after the Division of Solid Waste has determined that the dredged material falls outside of their purview. If the project proponent believes their dredged material to be hazardous, under the state's definition, he/she would apply directly to the Division of Hazardous Waste for the permits necessary to dispose of the material at a hazardous waste landfill.

In the case that dredged material disposal operations are proposed in an Area of Critical Environmental Concern (ACEC), the permit review process is further circumscribed (21A M.G.L.A. — 301 C.M.R. 12.00). ACECs are areas within the state that the Secretary of the EOEA designates as being of regional or statewide significance. Such areas can be either inland or coastal and may include inland wetlands habitats, fishery habitats, and barrier beaches. Disposal of marine-dredged material may not occur within ACECs "except for the sole purpose of beach nourishment, dune construction or stabilization with proper vegetative cover, or the enhancement of fishery or wildlife resources" (310 C.M.R. 9.401(b)).

Under the Massachusetts Ocean Sanctuaries Program, dredged material disposal and fill activities can take place in designated ocean sanctuaries only after the Massachusetts Department of Environmental Management (MDEM) ocean sanctuaries coordinator deter-

mines that the disposal operations will not run counter to the Massachusetts Ocean Sanctuaries Act (132A M.G.L.A. 13-16, 18 — 302 C.M.R. 5.00). The Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement (MDFWELE) has advisory responsibilities under a variety of statutes including the marine fisheries regulations and the state's natural heritage and endangered species programs. Finally, the Board of Underwater Archaeological Resources and the Massachusetts Historical Commission may be brought into the picture in instances where proposed dredging management operations could potentially impact submerged cultural resources. This review is mostly advisory, but if the proposed activities are expected to impact submerged cultural resources, a permit may be required before the project can proceed.

The review of dredging and dredged material disposal and fill projects is much less extensive at the local level as opposed to the state and federal levels. Under the Wetlands Protection Act (WPA — 131 M.G.L.A. 40), local conservation commissions review activities which would "remove, dredge, alter or fill" wetlands within the municipalities' jurisdictions, including dredging activities, and issue Orders of Conditions which set out conditions deemed necessary to protect public interests, including fisheries habitat, land containingshellfish, water supplies, and wildlife habitats. In addition, many cities and towns enforce their own wetlands protection by-laws, which are intended to supplement the WPA and often require the proponent to obtain a local permit before proceeding with the project. Any Order of Conditions under the WPA can be appealed to the MDEP if any one of a number of interested parties, e.g., the applicant or a "person aggrieved," contends that the Order is inconsistent with the WPA or its regulations. In certain circumstances other local bodies, e.g., the Board of Selectman or the Zoning Board of Appeals, may get involved in the dredging disposal process. The nature of their involvement depends on the local laws that are in place. For example, if the local wetlands by-law is contained in the town's zoning by-laws, the

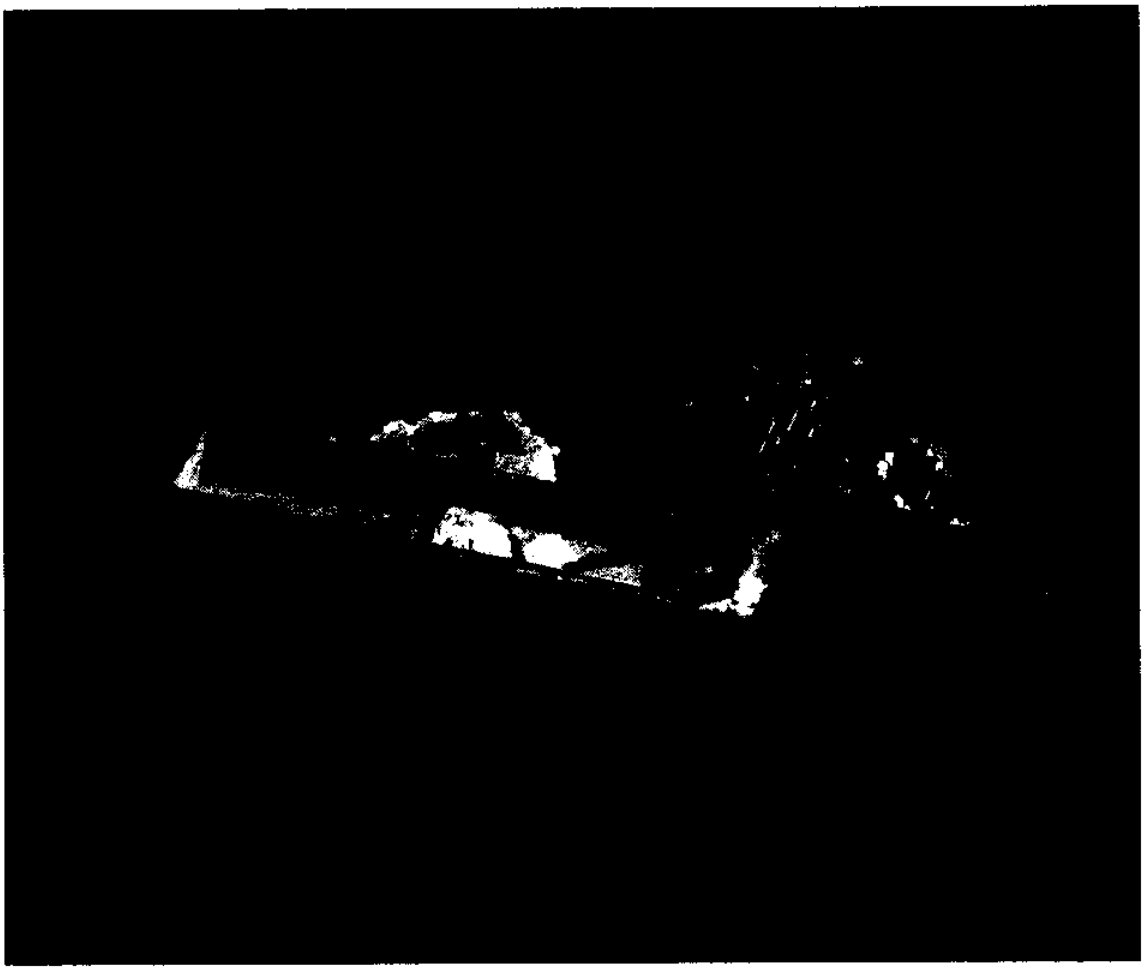
The Primary Requirements of

Local Laws Affecting Marine-Dredged Materials Management

Wetlands Protection Act

- Authorizes local conservation commissions to review dredging activities and issue orders of conditions

dredging project may have to be approved by the zoning board of appeals. Despite the more limited nature of local, as opposed to state or federal, review of dredged materials management, local powers can nevertheless have a significant impact on many stages in the management process, including the selection of upland disposal options and on the use of dredged materials for fill used to create parks and land for development.



Clamshell dredge and barge

PAST WORK OF THE INTERAGENCY COMMITTEE

Because of the difficulties associated with the management of marine-dredged materials, a cross-section of state and federal agencies came together in 1985 to devise a long-term strategy for the management of such materials. Members of this Interagency Committee on Marine-Dredged Material Disposal represented the MCZM, USEPA, Region 1, the New England Division of the USACOE, MDEM, MDEP, the MEPA office, the MDFWELE, Division of Public Works, NOAA, NMFS, USFWS, the Massachusetts Division of Marine Fisheries and other interested parties.

From 1985 through 1988 the Committee met on a fairly regular basis to discuss dredging issues and the ways in which the process of management could be carried out in an environmentally responsible manner. The Committee recommended that the sediment testing protocols for ocean disposal be revised to take into account the special situations pertaining to Massachusetts's area sediments. This was subsequently done by USEPA, Region 1 and the USACOE, New England Division (U.S. Environmental Protection Agency, Region 1, and the U.S. Army Corps of Engineers, New England Division, May 15, 1989). The Committee also recommended the preparation of a Generic Environmental Impact Report (GEIR) on dredged material disposal options for sediments dredged from Boston Harbor that fail to satisfy MPRSA's Ocean Dumping Criteria. Unfortunately, funding for the GEIR failed to materialize and the Committee disbanded.

PRESENT AND POTENTIAL FUTURE EFFORTS OF THE TASK FORCE ON MARINE-DREDGED MATERIALS MANAGEMENT

In early 1991, many of the same agencies that had formed the Committee in 1985 reconvened with local government representatives, environmental interest groups, and members of the general public to create a Task Force on Marine-Dredged Materials Management. The primary purpose of this Task Force is to devise a comprehensive, long-term management strategy for marine dredging and disposal of dredged materials that is environmentally, technically, and economically sound. With this strategy in place it is anticipated that the dredged materials review process will be more comprehensive, consistent, and coherent and, therefore, rely less on case-by-case decisionmaking which has, in the past, often caused project proponents and regulatory agencies alike to expend extra time and energy.

Initial efforts of the Task Force have gone into identifying priorities and organizing the membership into subcommittees to provide guidance for focusing efforts on specific topics, e.g., protocol revisions, economic issues, and others. The Task Force recognizes the need for funding to develop and implement a long-term strategy for managing dredging and dredged material disposal in Massachusetts. For each management option there are regulatory, economic, and technical and scientific issues which must be considered in making informed decisions. As noted earlier, there is a pressing need to assemble existing information, identify gaps in our knowledge, and formulate a response that is more cohesive than our past attempts in resolving conflicting views and approaches.

Setting priorities for the Task Force has resulted, in part, from a necessity to resolve issues related to specific, major dredging proposals , such as the Central Artery/Third Harbor Tunnel Project and the Massport Boston Harbor Navigational Improvement Project.

Both of these projects highlight the need for feasible and reasonable options for disposing of contaminated dredged materials from urban harbors. Over the past few years, the application of the New England and revised national protocols for testing sediments has shifted the focus of discussion from what constitutes contaminated sediments to managing the disposal of these sediments. This issues has been identified as a major focus of the Task Force.

Closely related to the options for management of contaminated sediments is the cost, both fiscal and environmental, of the various alternatives. Environmental costs, which are generally not well-defined or valued, are not equally weighted with actual dollar costs of management options in the decision-making process. The technical, economic, and environmental viability of the various management options described in this paper must be evaluated. It is one thing to discuss a specific management option in hypothetical terms, but it is quite another to determine if that option can and should be exercised within the Massachusetts context. In this vein, the Task Force will have to answer such questions as: "Are the construction and operation and maintenance costs of nearshore containment facilities prohibitively high?"; "Is capping technically feasible, either in the open ocean or nearshore environment?"; "Is there any space available at upland sanitary landfills?"; and "What is the expected volume of dredged material that will have to be managed over the next 50 years, and which mix of management options can best meet those needs?"

Taut-wire moored disposal buoy

In addition to those issues highlighted above, there are various regulatory issues that the Task Force will have to confront. One example of this is the inherent tension between the imperatives of the CWA and MPRSA and how it may affect marine-dredged material management options. This tension, which was evidenced in the debate over the disposal of contaminated sediments from the Central Artery/Third Harbor Tunnel Project (Massachusetts Department of Public Works, 1990), is discussed below.

The USACOE, as the permitting authority for MPRSA (section

103), requires that ocean disposal of any kind of dredged material be avoided unless the applicant establishes a need to ocean dump, which is accomplished by evaluating the alternative management options. It is up to the permitting agency to decide whether other alternatives can feasibly be implemented in an environmentally sound manner and in compliance with the ocean dumping criteria. Those alternatives include management options in 404 waters, e.g., nearshore and shoreline containment facilities, and upland disposal. As the permitting authority for Section 404 of the CWA, the USACOE must comply with the 404(b)(1) guidelines that require a rebuttable presumption that there exist managment options outside 404 waters. Specifically, the USACOE cannot allow the discharge of dredged or fill material in 404 waters "if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have any other significant adverse environmental consequences. . . . An alternative is practicable if it is [among other things] available and capable of being done after taking into consideration costs, existing technology, and logistics in light of overall project purposes" (Federal Register, December 24, 1980, 85348).

Thus, the USACOE's responsibilities under MPRSA and CWA tend to push the agency towards upland disposal as the option of choice. However, upland disposal is not generally a viable option, primarily for lack of available space and economic considerations. This leaves the USACOE in a curious spot. Where upland disposal is not a viable option (probably in most cases), MPRSA pushes the USACOE to first consider management options in 404 waters before going to ocean disposal, while the CWA pushes the Corps to first consider disposal options in ocean waters before going to 404 waters. How to resolve this dilemma — the potentially conflicting priorities of MPRSA and the CWA — is an issue that will be taken up by the Task Force. Similarly, the Task Force will have to evaluate whether upland disposal is actually a non-viable management option in most cases, for

if it is unacceptable, the need to resolve the dilemma between the CWA and MPRSA becomes all the more important.

Another regulatory issue that the Task Force identified is the adequacy of the sediment testing protocols for determining when marine-dredged materials are too contaminated to be managed through unconfined disposal in ocean waters. Among the questions to be answered are whether the test organisms adequately reflect the uptake characteristics of the organisms normally found at ocean disposal sites and whether the test organisms are sensitive enough to the contaminants of concern. Also at issue is whether the protocols offer regulators a decision framework that enables them to make consistent determinations about the suitability of marine-dredged materials for unconfined disposal. Another important, but often neglected issue, is the capability of testing laboratories to meet analytically prescribed detection limits (Pederson, 1991).

The Task Force has also identified economnic issues as a major concern and it will examine the way in which costs and benefits are taken into consideration when deciding which dredged material management option(s) to use. To understand these economic issues more fully and the challenges facing the Task Force, the following example discusses, in detail, the review process for coastal dredging projects involving federal participation. In such cases, there are three stages at which environmental and other project-related impacts are considered and balanced qualitatively and/or quantitatively. These are when (1) the Corps evaluates a project under NEPA, (2) the Corps determines the National Economic Development (NED) Benefits associated with a project, and (3) the local sponsor evaluates a project under MEPA.

As mentioned earlier, NEPA requires that all federal agencies proposing projects that will "significantly" affect the quality of the "human environment" prepare an EIS. The NEPA regulations leave it to the individual agencies to devise their own procedures for determining when an EIS is necessary. The USACOE, as do all other federal

agencies, uses an EA to determine if the significant impact threshold is reached. According to USACOE regulation 200-2-2 (Procedures for Implementing NEPA — March 4, 1988),

> "An EA is a brief document which provides sufficient information to the district commander on potential environmental effects of the proposed action and, if appropriate, its alternatives, for determining whether to prepare an EIS or a FONSI [Finding Of No Significant Impact]" (5)

There is no format for the EA provided in the regulations but, based on a review of both the EA for the Boston Harbor Navigation Improvement Project and various in-house planning documents used by the USACOE, a "generic" EA includes an evaluation of the following types of impacts: biological, chemical, and physical impacts on the resources at the dredging disposal site, e.g., increased turbidity, burial of non-motile organisms, suspension of contaminated sediments and contaminants, impacts on groundwater and surface waters (assuming land-based disposal); potential human health impacts; impacts on threatened or endangered species; impacts on historic or archeological sites; and other social and economic impacts that the project and proposed alternatives may have, e.g., economic savings due to improved navigation.

Although these various impacts are to be considered in the EA, there is no systematic methodology employed for balancing the environmental, economic and other costs identified with benefits. The district commander reviews the evidence presented in the EA and decides whether a FONSI is the appropriate response (as was the case with the Boston Harbor Navigation Improvement Project). If the district commander determines that there are significant impacts related to the project, then an EIS is prepared after completion of the scoping process. The inter-agency and public comments received during the scoping process are intended to help the USACOE clarify the significant issues that should be covered by the EIS. The com-

ments are considered along with the statutory/regulatory requirements of NEPA as well as the USACOE's internal guidance documents in determining the actual coverage of the draft EIS. After submitting the draft EIS for public and inter-agency review, the USACOE must then respond to the comments received in the course of revising the EIS into its final form.

The extremely broad coverage of the statutory/regulatory requirements of NEPA, the CEQ's guidelines for EIS preparation, and the USACOE's own guidance documents on EIS preparation, require, in theory, that the USACOE consider virtually all environmental impacts relating to both the proposed project and all the alternatives, including the no-build alternative. Indeed, the scoping process and the draft EIS review and comment period are designed to ensure that the USACOE considers as many of these impacts as possible. In practice, however, the USACOE has a great deal of discretion with respect to what impacts will be included in the EIS and how they will be addressed. The USACOE also has a great deal of discretion in deciding which alternative project to propose in the final EIS. NEPA does not require the USACOE to select the least environmentally damaging alternative. In making a decision on which project to propose, the USACOE is supposed to balance environmental with other concerns, e.g., technical and economic issues, but there is no requirement that a formal cost/benefit analysis be performed. There is, however, one quantitative measure with which any USACOE project must comply. According to USACOE, and not NEPA regulations, the benefit-cost ratio (BCR) of the project must exceed unity (1) — thus, a federally sponsored project must result in net economic gain to the national economy. As long as the proposed project is above this floor requirement, the USACOE can consider it as a viable alternative. If a positive BCR is not shown, the project is relegated to state and/or local authorities. To determine if the BCR of a proposed project exceeds unity, the USACOE relies on the methodology contained in regulations titled "NED [National Economic Development] Benefit

Evaluation Procedures: Transportation (Deep-Draft Navigation)" (U.S. Army Corps of Engineers, July 9, 1983). The regulations state, in part, that:

> "This subpart presents the procedure for measuring the beneficial contributions to national economic development (NED) associated with the deep-water draft navigation features of water resources plans and projects. . . . The basic economic benefits from navigation management and development plans are the reduction in the value of resources required to transport commodities and the increase in the value of output for goods and services." (A-42)

As this excerpt indicates, the BCR methodology focuses almost exclusively on navigation-related economic benefits and costs. The only indication that environmental or other impacts need be incorporated into the BCR comes on page A-44 of the USACOE's regulations:

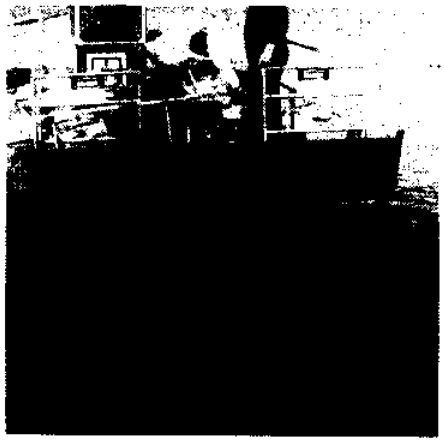
> "In the planning report, present the derivation and selection of with- and without-project conditions in accordance with the following guidelines:
>
> (1) State the assumptions specific to the study.
>
> (2) Specify the significant technical, economic, environmental, social, and other elements of the planning setting to be projected over the period of analysis. Discuss the rationale for selecting these elements."

Although the "environmental, social, and other elements" are to be specified and the rationale for their selection explained, there is no requirement that any attempt be made to quantify them. The section of the regulations titled "Compute NED Benefits" states that: "Once the tonnage moving with and without a plan is known and the

cost via the proposed harbor and via each alternative are known, compute total NED navigation benefits will be [sic] computed using the applicable discount rate."

The benefits included in this calculation are all navigation-related. Since the "environmental, social, and other elements" remain unquantified, they don't factor into the BCR and, therefore, have no effect on whether unity is exceeded. It is important to note, however, that agreement has not been reached on the applicability of quantification methods for many of the "environmental, social, and other" benefits and costs related to dredging materials management, and that even the less controversial methods are not applicable in every situation.

Using the BCR methodology, the USACOE concluded that the preferred alternative for the Boston Harbor Navigation Improvement Project — the combined tributary plan with Chelsea River being dredged to 38' and Mystic River and the Reserved Channel to 40' — had a BCR of 2.3 (U.S. Army Corps of Engineers, September 1988). This BCR was determined using a discount rate of 8-5/8% and a 50 year project life (the discount rate is the one currently applicable to all federal projects). It is interesting to note that even if the USACOE had contended that the project would result in significant environmental impacts that could be quantitatively captured in the BCR calculations, the costs related to those impacts would have had to have been fairly large to make the BCR fall below unity.



Inshore mini dredge

The MEPA process, as discussed earlier, has two stages. If the proposed project exceeds certain thresholds, the proponent is required to submit an ENF to the Secretary of EOEA, which contains preliminary data on the potential impacts of the project. After holding a scoping session and accepting public and inter-agency comments, the Secretary decides whether the project requires an EIR. If no EIR is required, the project may proceed. If an EIR is required, the Secretary notifies the project proponent of this finding in a Certificate on the ENF which outlines the suggested scope of the EIR, in-

cluding the alternatives that should be considered and the potential ways in which the feasibility of those alternatives might be assessed.

Like an EIS, an EIR is supposed to cover virtually the entire universe of potential negative and positive environmental impacts resulting from the proposed project and the alternatives. This is evidenced by the all-inclusive definition that the MEPA regulations give to the term "existing environment" in relation to which the impacts of the proposed project and the alternatives are to be measured:

> "The physical, biological, and social conditions of the site, its immediate surroundings, and the region should be described in sufficient detail to provide a baseline for the assessment of impacts identified in the scope.
>
> Characteristics typically discussed include:
>
> (a) topography, geology, and soils;
>
> (b) surface and groundwater hydrology and quality;
>
> (c) plant and animal species and ecosystems;
>
> (d) traffic, air quality, and noise;
>
> (e) scenic qualities, open space, and recreation resources;
>
> (g) the built environment and man's uses of the area; and
>
> (h) rare or unique features of the site and its environs."
>
> (301 CMR 11.07(5))

This list is meant as a guide - the Secretary can include other factors or limit the consideration of factors not thought to be significant.

According to the regulations, the proponent's analyses of how the project and the alternatives might impact the "existing environment"

> "will include the direct and indirect effects . . . , both in the short and long term, and will deal explicitly with all phases of the project (e.g., acquisition, construction, development, and operation). It is expected that all effects will be quantified to the maximum extent practical, that all

effects will be traced through to their ultimate influence on man, and that cumulative effects of the proposed project and other projects in the area will be considered." (301 CMR 11.07(6))

The expectation that "effects will be quantified to the maximum extent practical" is not tantamount to requiring that a cost/benefit analysis be performed. Indeed, as the Secretary made clear in her Certificate on Massport's recent ENF (June 7, 1991), the proponent is not required to perform a formal cost/benefit analysis — it is up to the proponent to submit the cost/benefit information he/she deems warranted.

Although a variety of the costs and benefits of dredging projects are quantified during the review process for projects with federal involvement, most of them relate to navigational issues, e.g., greater access by large ships and reduced lightering (movement of fuel products from large ships to smaller ships capable of passage through shipping channels). Other potential costs and benefits that are usually either left unquantified or totally ignored during the review process fall into the following areas:

- Recreation — potential impacts on local recreational fishing, boating, and swimming as well as the impacts on commercial boating concerns such as whalewatching and open ocean fishing.

- Aesthetics — the visual impacts relating to dredging and disposal operations.

- Option and existence values — the value that people attach to either having the option to use a resource, e.g., Stellwagen Bank, in a relatively uncontaminated state or just knowing that such a resource exists. For example, people may highly value just knowing that the Bank area is not being further degraded.

- Cumulative impacts — Although cumulative impacts are supposed to be considered during the ocean disposal site designation process, there is no requirement that they be considered in the context of individual dredging projects. Evaluating dredging projects on a case-by-case basis can lead to an unacceptable level of environmental degradation. Each project, on its own, may not result in unacceptable environmental damage, however, when a project is considered in conjunction with other projects in the area, the impacts on the environment may be unacceptable.

- Hazards — a project may reduce potential hazards, e.g., less lightering leading to a lowered chance of spills, or create new hazards, e.g., disposal barge interference with boat traffic.

- Lost use opportunity — The costs resulting from the degradation of a resource to the point that its use is restricted or completely prohibited, e.g., closure of shellfish beds and lobstering grounds.

- Indirect economic impacts — the costs and benefits that are not directly attributable to dredging activities but are indirectly affected by those activities, e.g., reduced boat sales resulting from a decreased desire to use boats in the vicinity of dredging operations or disposal areas.

The Task Force must resolve for itself whether the costs and benefits of these and other impacts should be quantified and incorporated into dredged material management decisions and, if so, recommend the most effective means of accomplishing this within the appropriate agencies and other organizations.

As of this writing the Task Force is in the process of putting together regional subcommittees (North Shore, Massachusetts Bay, Outer Cape Cod, Buzzards Bay, Cape Cod Bay, and Mount Hope Bay)

and issue subcommittees (e.g., economics and planning, regulatory revisions, management of contaminated sediments, protocol revisions, and others) to address the topics mentioned above as well as other issues that must be resolved in order to devise a long-term strategy for dredged materials management. The Task Force is planning to convene a number of public meetings on issues of particular concern, e.g., the ways in which costs and benefits are considered in dredged materials management decisions and the protocols used to determine if dredged materials are suitable for unconfined, open water disposal. The meetings will be sponsored by the the MCZM, the New England Division of the Corps, and other agencies represented on the Task Force.

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